

CLAIMS

1. A method of forming a patterned self-assembled monolayer (20) on a substrate (24) by means of a soft lithographic patterning process, the method comprising:
 - a) providing patterning means (10) for defining the required pattern of said patterned self-assembled monolayer (20);
 - b) forming a self-assembled monolayer (20) on a surface (22) of said substrate (24);
 - c) applying said patterning means (10) to said surface of said substrate (24), said patterning means (10) being arranged to deliver a modifier to selected areas of said substrate surface, said selected areas corresponding to said required pattern or a negative thereof, said modifier comprising a chemical and being arranged to alter at said selected areas the strength of interaction between the molecules of said self-assembled monolayer (10) and said surface of said substrate (24); and
 - d) selectively removing or replacing areas of said self-assembled monolayer (20) that, after step c), exhibit a lower strength of interaction between the molecules thereof and said surface of said substrate, thereby to form a self-assembled monolayer (20) having said required pattern.
2. A method according to claim 1, wherein said patterning means (10) comprises a patterned stamp defining the required pattern of said patterned self-assembled monolayer (20).
3. A method according to claim 1, wherein said patterning means (10) comprises a substantially non-patterned stamp and a mask defining the required pattern of said patterned self-assembled monolayer.
4. A method according to any one of claims 1 to 3, wherein said modifier is selected to reduce the strength of the interaction between the molecules of the self-assembled monolayer (20) and said substrate surface.

5. A method according to any one of claims 1 to 3, wherein said modifier is selected to increase the strength of the interaction between the molecules of the self-assembled monolayer (20) and said substrate surface.
6. A method according to any one of the preceding claims, wherein said self-assembled monolayer (20) is formed by immersing the substrate (24) in a solution of molecules, or exposing the substrate to an atmosphere containing molecules for a sufficient amount of time to cause the self-assembled monolayer (20) to be formed thereon by adsorption.
7. A method according to any one of claims 1 to 5, wherein the self-assembled monolayer (20) is formed on the substrate by bringing into contact therewith a non-patterned stamp carrying the molecules of which the monolayer is to be formed.
8. A method according to any one of the preceding claims, wherein said substrate (24) comprises a base with an additional layer (22) of material provided thereon, said self-assembled monolayer (20) being provided on said additional layer (22).
9. A method according to claim 8, further comprising the step of etching said substrate (24) to remove selected portions of said additional layer (22) in accordance with said required pattern, thereby to form an additional patterned layer (22) on the substrate.
10. A method according to any one of claims 1 to 8, further comprising the step of depositing material in selected regions of said substrate in accordance with said required pattern, thereby to form an additional patterned layer on said substrate.
11. A method according to any one of claims 1 to 10, wherein said modifier comprises a chemical, selected to alter the strength of interaction between the molecules of said self-assembled monolayer (20) and said substrate surface.

12. A method according to claim 11, wherein said modifier comprises a chemical, selected to alter the strength of interaction between the molecules of said self-assembled monolayer with time, or in response to an external stimulus.
13. A method according to claim 12, wherein said external stimulus comprises electromagnetic radiation.
14. A method according to claim 13, wherein said external stimulus comprises ultra-violet radiation or visible light.
15. A method according to any one of claims 1 to 14, wherein said self-assembled monolayer comprises thiol molecules.
16. A method according to any one of claims 1 to 12 or claim 15, wherein the modifier contains molecules of one or more of the following classes: oxidising or reducing agents, electron- or atom-transfer reagents, reagents that cause formation or cleavage of a chemical bond.
17. A method according to claim 2 or claim 3, wherein said stamp (10) is formed of an elastomeric material.
18. A method according to claim 2 or claim 3, wherein said stamp (10) is substantially transparent to electromagnetic radiation.
19. A method according to claim 17 or claim 18, wherein said stamp (10) is formed of a polymer.
20. A method according to claim 19, wherein said stamp (10) is formed of poly(dimethylsiloxane).
21. A method according to claim 2, claim 3 or any one of claims 17 to 20, wherein the modifier comprises a chemical having an affinity for the material of which said stamp (10) is formed.

22. A substrate (24) having thereon a patterned self-assembled monolayer (20) obtained by means of the method according to any one of claims 1 to 21.
23. A substrate (24) having thereon an additional patterned layer (26) obtained by means of a method according to claim 9 or claim 10.
24. Soft lithographic patterning apparatus arranged and configured to perform the method of any one of claims 1 to 21.
25. Use of a modifier, comprising a chemical, on a patterning means (10) in a soft lithographic patterning process to alter, at selected areas of a self-assembled monolayer (20) on a substrate (24), the strength of interaction between the molecules of said selected areas of said self-assembled monolayer (20) and the surface of said substrate (24) on which said self-assembled monolayer (20) is provided, said selected areas of said self-assembled monolayer (20) corresponding to a required pattern or a negative thereof.